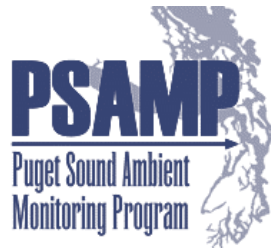


**2005 Review of the
Puget Sound Ambient Monitoring Program
Final Report**

PSAMP Management Committee

October 20, 2005



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Executive Summary

In March 2005, the Management Committee of the Puget Sound Ambient Monitoring Program (PSAMP) decided to conduct a focused review of the monitoring program. The main objective of the review was to assess the current program relative to the statutory direction in the state Puget Sound Water Quality Protection Act (RCW 90.71) combined with the priorities in the 2005-2007 Puget Sound Conservation and Recovery Plan. The approach was to conduct a rapid review focusing on a subset of issues within the scope of PSAMP, rather than a lengthier, more comprehensive review.

The review was based on four workshops that were convened in July 2005 that focused on three topics that are addressed by PSAMP and the priorities in the 2005 Puget Sound Conservation and Recovery Plan: hypoxia, toxics and nearshore habitat. The attendees of each workshop included some combination of members of the PSAMP Management and Steering committees as well as external specialists.

The overall findings are structured around the following review questions:

Review Question	Finding
1. How well does PSAMP assess the health of Puget Sound?	PSAMP is very successful in its primary mission of delivering data and analysis for the assessment of the health of Puget Sound. Examples include: <ul style="list-style-type: none">• oxygen depletion in Hood Canal;• contaminants in sediments and the marine food web.
2. How well does PSAMP assess the success of management strategies?	<ul style="list-style-type: none">• Generally PSAMP does not assess implementation or effectiveness of specific management strategies, particularly at the local scale;• DOH shellfish component is very effective in assessing specific corrective actions;• PSAMP effectively assesses cumulative environmental outcomes of management actions at the regional scale.
3. How well does PSAMP fill science gaps to help develop management actions?	<ul style="list-style-type: none">• Limited focused research addresses specific management questions or corrective actions;• Studies do not have dedicated funding;• Studies not comprehensively meeting management needs.
4. How well does the current governance structure of PSAMP function?	<ul style="list-style-type: none">• Linkages between management and PSAMP research need to be strengthened.

Overall Recommendations

1. Strengthen connections between PSAMP, the Puget Sound Action Team and Puget Sound Council
 - Directly coordinate PSAMP with the State of the Sound Report
 - Create process to regularly report scientific findings to PSAT and Puget Sound Council and trigger the development of action plans
 - Include science advice in strategic management actions in marine and estuarine waters
 - Increase coordination between PSAMP Steering and Management Committees and the Management Team of the Puget Sound Action Team.
2. Strengthen connection between the Puget Sound Ambient Monitoring Program and key external entities and processes including:
 - Governor's Monitoring Forum and Comprehensive Monitoring Strategy
 - Puget Sound Ecosystem-Based Management (lead by Northwest Fisheries Science Center).
 - Puget Sound Nearshore Program
 - Shared Strategy Salmon Recovery Plan
 - Develop budget requests as part of local, state and federal processes that include assessment, monitoring and accountability
3. Expand the scope of the Puget Sound Ambient Monitoring Program (adopt new name Puget Sound *Assessment* and Monitoring Program).
 - Expand role to include ambient, effectiveness and validation monitoring and other assessment monitoring
 - Expand role to providing science advice (adopt new name Puget Sound Science Advisory Work Group)
 - Identify gaps in science for Puget Sound Conservation and Recovery
 - Conduct scientific review of monitoring and assessment proposals
 - Expand participation on PSAMP Steering and Management Committees to all relevant monitoring and assessment programs that contribute to the Health of Puget Sound assessment, Puget Sound Conservation and Recovery Plan, and potentially Puget Sound Initiative
 - Include currently non-represented state and federal monitoring programs
 - Include Sea Grant and other university programs
 - Include tribal government efforts
 - Include local government and NGO efforts

1 Introduction

Background

The Puget Sound Ambient Monitoring Program (PSAMP) is an interagency partnership formed to assess the condition of Puget Sound and its resources. The Puget Sound Water Quality Protection Act (RCW 90.71) directs the Puget Sound Action Team (PSAT) to implement and coordinate the program. Under this state statutory mandate, the program shall include, at a minimum:

- *“A research program, including but not limited to methods to provide current research information to managers and scientists, and to establish priorities based on the needs of the action team”*
- *A monitoring program... the action team shall develop performance measures that can be used by the governor and the legislature to assess the effectiveness over time of programs and actions initiated under the [Puget Sound management] plan to improve and protect Puget Sound water quality and biological resources.” (RCW 90.71.060)*

PSAMP is currently composed of a diverse group of organizations and monitoring efforts (see Table 1).

In March 2005, the PSAMP Management Committee decided to conduct a focused review of the monitoring program. The Puget Sound Action Team and the Puget Sound Council expressed support for this review at their joint meeting on May 19, 2005.

The main objective of the review was to assess the current program relative to the statutory direction and the priorities of the 2005-2007 Puget Sound Conservation and Recovery Plan. The approach was to conduct a rapid review focusing on a subset of issues within the scope of PSAMP, rather than a lengthier, more comprehensive review.

The review was not intended to provide a thorough technical evaluation of PSAMP work. Instead, its goal was to explore the degree to which PSAMP fulfills its mandate with respect to several topics of management importance. As a result, the review does not address the full scope of PSAMP. Many components of the program are underrepresented (i.e., the biological components that monitor groundfish, salmon, offshore birds, and marine mammals). One desired outcome of the review was to determine whether additional workshops should be completed for other priority topics, or alternative methods for review should be adopted in the future.

Table 1. Highlights of PSAMP Monitoring Activities

Monitoring Activity	Agency	
Marine sediment contaminants Temporal monitoring: annual monitoring of sediment chemistry and biota at 10 long-term stations to determine long-term trends; 1989+. Spatial monitoring: annual monitoring of sediment chemistry, toxicity, and biota rotating through 8 Puget Sound regions to determine extent of sediment quality degradation; 1997+.	Washington State Department of Ecology (WDOE)	State Agency Partners
Marine water quality Monthly sampling at 19 fixed stations plus rotating stations of temperature, dissolved oxygen, pH salinity, density, fecal coliform, chlorophyll, nutrients and water clarity. 1973+	WDOE	
Fresh water quality Monthly sampling at 33 rivers and streams in the Puget Sound basin. Parameters include nutrients, suspended solids, conductivity, fecal coliform, dissolved oxygen, temperature, pH and turbidity. 1959+	WDOE	
Fish contaminants Surveys of contaminant levels in rockfish, English sole, herring and salmon, including PCBs, PAHs, metals and PBDEs. Monitoring of liver disease in English sole. Also, contaminants in Dungeness crab and endocrine disruption of male fish.	Washington State Department of Fish and Wildlife (WDFW)	
Fish abundance Surveys for bottomfish using trawl, scuba, and video techniques throughout the inland marine waters. Stock assessments on selected species including rockfishes, lingcod, Pacific cod, Pacific whiting, flatfishes, greenlings, and unclassified marine fishes. Monitoring of marine reserves.	WDFW	
Marine birds and mammals Summer and winter aerial surveys of nearshore and offshore marine birds and waterfowl. Summer surveys: 1992-2002; winter surveys: 1992+. Focused efforts have contributed to boat surveys of winter shorebirds, harbor seal censuses and contaminant studies.	WDFW	
Nearshore habitat Eelgrass: annual sampling throughout greater Puget Sound; 2000+. Floating Kelp: annual surveys in Strait of Juan de Fuca and outer coast; 1989+. Intertidal Biota: yearly infauna and epibiota surveys in central and southern Puget Sound. 1997+	Washington State Department of Natural Resources	
Shellfish growing area water quality and shellfish PSP Annual analysis of spatial and temporal trends in fecal coliform levels in shellfish growing areas and biotoxin levels in Puget Sound shellfish. PSAMP analysis leverages data collected as part of Health regulatory programs.	Washington State Department of Health	
Coordination Chair of PSAMP steering and management committees; coordinates program-wide publications and co-chairs the Puget Sound – Georgia Basin Research Conference series.	Puget Sound Action Team staff	Federal, Local and University Partners
Marine water quality, sediment contaminants and shellfish condition Surveys of water quality parameters, sediment infauna and contaminants, shellfish contaminants and macroalgae contaminants.	King County Department of Natural Resources and Parks	
Technical and programmatic support. Sponsorship of targeted studies.	U.S Environmental Protection Agency	
Contaminant burdens and associated health effects in fish and birds	NOAA Fisheries (NMFS)	
Fish and marine mammal toxicology	U.S. Fish and Wildlife Service	
Marine water properties & primary production: biannual PRISM cruises, 1997+ Circulation, biogeochemical, and watershed modeling: through PRISM, PSMEM, and HCDOP Science lead for HCDOP-IAM	University of Washington	

Approach

The PSAMP Management Committee formed a working group to direct the review process that included Loren Stern (WDNR), Michael Rylko (EPA), Tracy Collier (NOAA Fisheries), Bill Backus (Ecology), Scott Redman (PSAT) and Sarah Brace (PSAT). This group decided to conduct ½ day workshops to focus on each of three topics that are addressed by PSAMP and the priorities in the 2005 Puget Sound Conservation and Recovery Plan. Members of the Steering Committee were recruited to help oversee the process (Sandie O'Neill, WDFW; Brian Grantham, Ecology) and leads were appointed for each of the workshops.

Review Topic	Leads	Relevant Priorities
Hypoxia	Dzinbal (Ecology)	Priority 4
Toxics	Rylko (EPA), Collier (NOAA Fisheries), Redman (PSAT)	Priorities 1, 2, 3 and 7
Nearshore Habitat	Stern (WDNR)	Priorities 5 and 6

A select group of members of the Management and Steering committees as well as external specialists attended the ½ day workshops. A total of four workshops were convened in July 2005 (the Toxics group held two separate sessions). The leads for each topic prepared written summaries of their respective workshops that are included as later sections of this report. These summaries are structured around the following questions:

1. How well does PSAMP assess the health of Puget Sound?
2. How well does PSAMP assess the success of management strategies?
3. How well does PSAMP fill science gaps to help develop management actions?
4. How well does the current governance structure of PSAMP function?

In August, the working group reviewed the workshop reports and common themes were discussed at a joint meeting of the Management and Steering Committees. On October 13, the Management Committee met to finalize recommendations from the review and the final report was presented to the Puget Sound Action Team and Puget Sound Council at a joint meeting on October 20, 2005.

Timeline 2005

March 5	Management Committee moves to have PSAMP review. Working group formed.
May 19	Puget Sound Action Team and Puget Sound Council support review proposal.
June 8	Loren Stern presents review plan to Steering Committee and recruits Steering Committee participation on working group.
July 18	Hypoxia Workshop
July 21	Toxics Workshop I
July 28	Nearshore Workshop
July 29	Toxics Workshop II
August 4	Working group reviews workshop summaries and strategy for drafting summary report.
August 11	Joint meeting of Management and Steering Committees review workshop summaries and draft summary of emergent themes.
September 7	Management Committee reviews second draft of review summary.
October 6	Puget Sound Action Team briefed on progress.
October 13	Management Committee finalizes review recommendations and reviews final report.
October 20	Final report is presented to joint meeting of Puget Sound Action Team and Puget Sound Council.

2 Common Themes of Hypoxia, Toxics and Nearshore Habitat Reviews and Overall Recommendations

Overall Findings

Findings for each of the four evaluation questions are summarized below (Table 2). More detailed findings and recommendations are included in the individual reviews.

While differences were noted, several common themes emerged from the reviews. All three reviews found that PSAMP strongly fulfills its statutory mandate to monitor environmental indicators. PSAMP is unique in its ability to provide long term monitoring information, and it comprises the primary information source used to assess the health of Puget Sound.

Table 2. Overall findings by review question.

Review Question	Finding
1. How well does PSAMP assess the health of Puget Sound?	PSAMP is very successful in its primary mission of delivering data and analysis for the assessment of the health of Puget Sound. Examples include: <ul style="list-style-type: none">• oxygen depletion in Hood Canal;• contaminants in sediments and the marine food web.
2. How well does PSAMP assess the success of management strategies?	<ul style="list-style-type: none">• Generally PSAMP does not assess implementation or effectiveness of specific management strategies, particularly at the local scale;• DOH shellfish component is very effective in assessing specific corrective actions;• PSAMP effectively assesses cumulative environmental outcomes of management actions at the regional scale.
3. How well does PSAMP fill science gaps to help develop management actions?	<ul style="list-style-type: none">• Limited focused research addresses specific management questions or corrective actions;• Studies do not have dedicated funding;• Studies not comprehensively meeting management needs.
4. How well does the current governance structure of PSAMP function?	<ul style="list-style-type: none">• Linkages between management and PSAMP research need to be strengthened.

With respect to PSAMP's ability to assess the success of management strategies, the reviews found that PSAMP is generally successful at assessing the success of management strategies with respect to ultimate outcomes (i.e. assessment of progress toward environmental goals). However, PSAMP is generally less successful at providing direct feedback on the effectiveness of management efforts, with some notable exceptions.

The current scope of PSAMP is more limited than the original program design. PSAMP does not have a comprehensive research program to inform management. With some exceptions, PSAMP generally is not funded to:

- directly monitor the implementation of management strategies
- address questions about the environmental effects of specific management actions
- investigate underlying causes of detected patterns.

All of the reviews found that the current governance structure of PSAMP functions poorly. There is little interaction between the oversight groups and the Steering Committee, which leads the PSAMP activities. Also, the program lacks a clear feedback loop between scientific findings and management actions.

Overall Recommendations:

1. Strengthen connections between PSAMP, the Puget Sound Action Team and Puget Sound Council.
 - Directly coordinate PSAMP with the State of the Sound Report
 - Create process to regularly report scientific findings to PSAT and Puget Sound Council and trigger the development of action plans
 - Include science advice in strategic management actions in marine and estuarine waters
 - Increase coordination between PSAMP Steering and Management Committees and the Management Team of the Puget Sound Action Team.
2. Strengthen connection between the Puget Sound Ambient Monitoring Program and key external entities and processes including:
 - Governor's Monitoring Forum and Comprehensive Monitoring Strategy
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 - Puget Sound Nearshore Program
 - Shared Strategy Salmon Recovery Plan
 - Develop budget requests as part of local, state and federal processes that include assessment, monitoring and accountability
3. Expand the scope of the Puget Sound Ambient Monitoring Program (adopt new name Puget Sound *Assessment* and Monitoring Program).
 - Expand role to include ambient, effectiveness and validation monitoring and other assessment monitoring
 - Expand role to providing science advice (adopt new name Puget Sound Science Advisory Work Group)
 - Identify gaps in science for Puget Sound Conservation and Recovery
 - Conduct scientific review of monitoring and assessment proposals
 - Expand participation on PSAMP Steering and Management Committees to all relevant monitoring and assessment programs that contribute to the Health of Puget

Sound assessment, Puget Sound Conservation and Recovery Plan, and potentially Puget Sound Initiative

- Include currently non-represented state and federal monitoring programs
- Include Sea Grant and other university programs
- Include tribal government efforts
- Include local government and NGO efforts

Detailed Findings and Recommendations by Review Question

Table 3 summarizes the findings for each review topic for each question. These findings are described in more detail following the table.

Table 3. Summary of findings for each individual review by question.

Review Question	Hypoxia Review	Toxics Review	Nearshore Review
1. How well does PSAMP assess the health of Puget Sound?	well	well	well
2. How well does PSAMP assess the success of management strategies?	mixed	needs improvement	mixed
3. How well does PSAMP fill science gaps to help develop management actions?	needs improvement	well	needs improvement
4. How well does the current governance structure of PSAMP function?	needs improvement	needs improvement	needs improvement

Question 1. *How well does PSAMP assess the health of Puget Sound?*

PSAMP produces status and trends indicators that are the foundation for general assessment and for “early warning”. The PSAMP data sets are unique in their breadth and their longevity, and they contribute significantly to understanding of long-term environmental conditions in Puget Sound. These indicators are reported in the Puget Sound Update, Puget Sound Health, the State of the Sound report, The Puget Sound/Georgia Basin Research Conference, agency publications, agency websites, and a variety of other forums.

There are many examples of PSAMP data being used to better understand environmental conditions and to focus management attention on areas of concern, including:

- oxygen depletion in Hood Canal;
- biotoxins and pathogens in Puget Sound shellfish;
- contaminants in sediments and contaminant levels in the marine food web;
- marine bird, mammal and fish health;
- habitat conditions, including nearshore areas and marine water quality.

Generally, geographic and temporal patterns in PSAMP data are evident at coarse scales (e.g., at the scale of oceanographic basins, or sound-wide). Focus studies and intensive sampling in areas of interest provide more detailed characterization.

One of the fundamental strengths of PSAMP is the synergy of its long-term and short-term research efforts. Long term monitoring results often stimulate collaborative research and monitoring. This work enhances the value of PSAMP beyond the formal, ongoing program.

Recommendations

- Maintain current monitoring – minimize interruption of time series.
- Re-establish breadth of monitoring that has been in recent years, e.g. toxics in birds, fish, mammals; abundance/distribution of birds, fish mammals.
- Establish new indicators to fill gaps in knowledge (see individual reviews for detailed recommendations).
- Add PSAMP stations in more highly managed areas or more proximal to potential sources.
- PSAMP should further develop and apply ecosystem and conceptual models to drive monitoring activities (Key Findings of 1995 PSAMP Review, Shen 1995).

Question 2. How well does PSAMP assess the success of management strategies?

PSAMP's ability to assess the success of management strategies is mixed. PSAMP does well at assessing success with respect to ultimate outcomes (ie. progress toward environmental goals) at the regional, or basin scale. However, PSAMP generally does not assess the effects of specific management strategies, particularly at the local scale (with some notable exceptions). In this way, the current program name and current scope reflects an original (i.e., pre-1996) concept of a fairly confined environmental monitoring program. Direct assessments of management strategies were generally beyond the extent of 'ambient monitoring.' Examples include:

- PSAMP is effective at identifying waters susceptible to hypoxia at a coarse scale and at identifying low dissolved oxygen levels. However, the program lacks funding to identify specific sources, dynamics, and processes that would allow for the recommendation of management actions. Nor can PSAMP adequately evaluate the effectiveness of projects or programs intended to mitigate conditions or reduce inputs possibly contributing to hypoxia.
- While PSAMP data is used by local planning efforts, PSAMP does not provide information to assess the success of efforts to protect and improve conditions through updates to Critical Area Ordinances (CAOs), Shoreline Master Programs (SMPs) or NPDES general stormwater permits.

Several PSAMP programs stand out as providing direct feedback on the success of management actions, including:

- The DOH shellfish pathogens program is tightly linked with regulatory activities and management actions. For example, it related onshore remedial action with reduced fecal pollution within relative short timeframes (several years) in Eld Inlet Oakland

Bay to repair of on-site sewage systems and city sewer lines, respectively. In other areas, it documented lack of progress, which is equally valuable information.

Recommendations

- Conduct monitoring to assess the short and long-term effectiveness of management actions and to provide accountability for agency decisions surrounding resource management and pollution control in Puget Sound.
- Develop logic models (after GMAP) that explicitly link PSAMP environmental monitoring to agency priorities and strategies.
- Institute a trigger mechanism for PSAMP investigators to focus attention or initiate diagnostic studies to identify corrective strategies and actions once ambient monitoring warning flags are acknowledged.
- More closely integrate regulatory and ambient monitoring.
- Improve direct coordination and communication of PSAMP science with agency programs and managers representing the Action Team.
- Establish mechanism to prioritize and fund diagnostic, problem-solving research, e.g. modeling that addresses causes of detected patterns upon which corrective actions can be based.

Question 3. How well does PSAMP fill science gaps to help develop management actions?

PSAMP does not have an established research program with coordinated goals and dedicated funding to fill science gaps to help develop management actions. In the absence of such a program, PSAMP scientists have focused on areas of concern and have spawned separate initiatives and collaborative efforts that are funded primarily by outside sources. Examples include:

- The Hood Canal Dissolved Oxygen Project Integrated Assessment and Modelling effort;
- The Puget Sound Nearshore Project;
- PBDE studies in fish and sediments;
- Endocrine disruption as evidenced by egg protein production in male fish.

While the research program portion of PSAMP has never been funded, PSAMP has been successful at addressing important gaps in monitoring and there is little-to-no duplication of monitoring activities among partner agencies or other collaborators.

While all of the reviewers recognized a need for greater research funding, there were conflicting views about potential integration of new research efforts with ongoing monitoring efforts. Some suggested that a research program should be established in a separate program with a separate management/science advisory body that identifies, prioritizes and conducts process-related studies. Others disagreed strongly with the conceptual or programmatic separation of monitoring and research. They stressed that the two should be integrated in order to gain the synergy between long-term and short term investigations that has been evident in PSAMP's work.

Recommendations

- Increase funding for diagnostic/problem solving research studies and technical integration.
- Use the results of diagnostic studies to catalyze better management strategies and actions.
- Define the roles and relationships of PSAMP, particularly in relationship to other research and science planning efforts.

Question 4. *How well does the current governance structure of PSAMP function?*

All three reviews found that the current governance structure of PSAMP functions poorly. The general perception is that the governing bodies are not actively involved in PSAMP activities, and familiarity with PSAMP is low within the Action Team (executive body), its Management Team, the Council, and the Puget Sound Action Team staff. There is little interaction between these oversight groups and the Management and Steering committees, which lead the PSAMP activities. The current governance structure of Steering and Management committees was developed in 1996 to address similar concerns expressed in the 1995 review (Shen 1995). Continuing concerns suggest that present-day implementation and/or institutional arrangements are not successful in meeting needs for PSAMP interaction with Puget Sound management.

More focused guidance of PSAMP's priorities is needed. Currently, PSAMP's mandate includes diverse goals, such as monitoring status/trends, assessing effectiveness of management actions, and identifying causes of observed changes. Current funding does not allow PSAMP to meet all of these goals. In order for PSAMP to meet its goals, goals could be more narrowly defined or PSAMP activities or funding could be expanded.

One significant change since 1995 has been the creation of several new bodies charged with coordinating statewide or regional monitoring activities (eg., the Governor's Monitoring Forum, the Pacific Northwest Aquatic Monitoring Partnership, Puget Sound Nearshore Ecosystem Restoration Project, the Shared Strategy for Salmon Recovery). Coordination among these bodies is anticipated to be a new governance challenge.

Recommendations

- Establish regular PSAMP participation at PSAT Partnership and Council meetings. Institute other mechanisms to tighten coordination between the oversight groups and the Steering Committee.
- Reform the activities and composition of the PSAMP Management Committee so that it coordinates and oversees the implementation of all the roles of science in the management of the Puget Sound system.
- Enhance integration and governance of monitoring and research activities through **topic groups** with ability to address topical concerns via two-way communication between scientists and managers.
- Institute mechanism to develop future funding requests based on PSAMP findings as a built-in part of the biennial budget cycle.
- Connect PSAMP more closely to the Governor's Monitoring Forum and other ongoing monitoring efforts.

- Conduct periodic comprehensive surveys of PS monitoring efforts (Key finding of 1995 PSAMP Review, Shen 1995)
- Increase the visibility of PSAMP results through improving outreach. Ideas include:
 - More effectively disseminate findings through press releases and other tools.
 - Enhance central web site and linkages between PSAMP component web sites to better link and communicate PSAMP program data.
 - Develop comprehensive data clearinghouse with web distribution of data.

3 PSAMP Toxics Review

Convened by Michael Rylko, Tracy Collier and Scott Redman representing the PSAMP Management Committee.

Meeting venue: EPA, Seattle, over two meeting dates of 07/21 and 07/29/2005.

Attendees (21):

John Calambokidis, Cascadia Research

Tracy Collier, NOAA Fisheries

Maggie Dutch, WDOE

Brian Grantham, WDOE

Alan Mearns, NOAA

Dale Norton, WDOE

Kim Stark, King Co.

Jim West, WDFW

Jean Zodrow, EPA

Jay Davis, USFWS

Allison Hiltner, EPA Superfund

April Markiewicz, Western Washington Univ.

Tom Mumford, WDNr

Sandie ONeill, WDFW

Heather Trim, People for Puget Sound

Gina Yitalo, NOAA Fisheries

Deb Lester, King Co.

This summary contains an assessment of PSAMP activities related to toxic contaminants, one of the stressors on Puget Sound ecosystems identified in the PSAMP conceptual model (Newton et al. 2000). The summary is divided into five parts. The first three questions review activities in terms of: (a) PSAMP's statutory mandate (Puget Sound Water Quality Protection Act (RCW 90.71.060, 1996)) and (b) the results desired of scientific efforts so they will effectively serve as a foundation for the conservation and recovery of Puget Sound (2005-07 Puget Sound Conservation and Recovery Plan (05-07 PSCRP), pp. 30-31 of final August 2005 version). The last two questions review PSAMP's implementation through examining governance and technical issues.

The findings and recommendations for each review question are summarized on the following pages. All recommendations by workshop participants are included. Recommendations are not prioritized, and do not reflect consensus.

Question 1. With regard to toxics, how well does PSAMP assess the health of Puget Sound?

Context

"A monitoring program...[that provides]...key indicators of Puget Sound health." (RCW 90.71.060)

Overall Assessment

Fairly well.

Geographic and temporal patterns are evident at coarse scale (e.g., Sound wide, main basin) from PSAMP data on contaminant levels in sediments and fish. Focus studies and intensive sampling of urban/industrial bays provide detailed characterization at the scale of bays. Effects on sediment-dwelling invertebrates and toxicity of sediments are key elements of the characterization of sediments. Effects on fish health are understood through PSAMP and collaborators' study with English sole and other species.

Observations/Findings:

- Cannot really account for quantities or trends in mass discharges into Puget Sound.
- Breadth of measures has declined in recent biennia (loss of PSAMP support for toxics in harbor seals, reductions in funds for fish contaminant work, loss of U.S. Fish and Wildlife Service PSAMP-affiliated studies of toxics in birds)
- Scales of assessment and management are not clearly identified or linked.
- Monitored species may change as monitoring or diagnostic studies become more localized.
- Need to update chemical analyte lists for each major source category.
- May be difficult to combine data from various projects/programs due to differences in sampling and analysis methods.

Recommendations:

- *Add PSAMP stations in more highly managed areas or more proximal to potential sources.*
- *Re-establish breadth of measures supported in prior years, e.g., toxics in mammals, birds and seals, and fish.*
- *Establish new indicators (body burden & effects) to fill gaps, e.g., plankton, invertebrates, and better linkage to human exposure.*
- *Support sediment cores as trends measure.*
- *Marine Bird conditions and measures of toxic exposure should be conducted for Osprey using data from Everett and Duwamish. Validation of use as estuarine monitoring tool for assessing toxics in local marine environments.*

Question 2. With regard to toxics, how well does PSAMP assess the success of management strategies?

Context

“A monitoring program...[that provides]...performance measures that can be used by the governor and legislature to measure the effectiveness over time of programs and actions initiated under the [Puget Sound management] plan to improve and protect Puget Sound water quality and biological resources.” (RCW 90.71.060)

“Apply scientific findings to evaluate the effectiveness of management activities and suggest adaptations and refinements to strategies to ensure that the stated goals for Puget Sound priorities and programs are achieved.” (05-07 PSCR)

The Puget Sound 2005-2007 Conservation and Recovery Plan is organized around four priorities that are closely related to toxic contaminants:

- Priority 1: Clean up contaminated sites and sediments
- Priority 2: Reduce continuing toxic contamination and prevent future contamination
- Priority 3: Reduce the harm from stormwater runoff
- Priority 7: Conserve and recovery orca, salmon, forage fish, and groundfish

The 2005-07 Conservation and Recovery Plan describes strategies, programs, and activities to address these priority issues.

Overall Assessment

Poorly.

No PSAMP toxics studies are (or have been) designed to address questions about the environmental effects of specific management actions. Some of these types of studies are done by others (e.g., NOAA Northwest Fisheries Science Center study of English sole liver lesions following capping at Eagle Harbor, Myers et al. 2005).

PSAMP-based characterizations of geographic and temporal trends might be used to develop line of evidence that cumulative management actions are/are not having an effect toward the desired ultimate outcome.

Observations/Findings:

- Environmental performance measures for toxic load reductions and environmental response are generally lacking.
- PSAMP data are used to provide context for site-specific monitoring (e.g., Superfund site assessment or long-term monitoring).
- Program name (and current scope) reflects an original (i.e., pre-1996) concept of a fairly confined program; assignments to “assess the success of management strategies” require efforts beyond “ambient monitoring.”

Recommendations:

- *Consider changing the (confining) name of PSAMP – to ‘Assessment & Monitoring’ (rather than ‘Ambient Monitoring’) – and retaining PSAMP as the program acronym. Easy but significant in clarifying the additional functions expected from PSAMP.*
- *Reform regulatory programs (NPDES, Superfund, MTCA) to include ambient monitoring to be integrated with PSAMP by developing a program similar to Southern California Coastal Water Research Project or San Francisco Bay’s Regional Monitoring Program.*

- *Develop logic chains for program activities & conceptual model for ecological indicators/outcomes.*
- *Create a mechanism to deliver toxics support for other PSAMP topics (e.g., potential effects of sediment & water quality on eelgrass).*
- *Estimate loads in streams & rivers (e.g., from toxic TMDLs) and compare various locations and sources for prioritizing source control strategies.*
- *Develop and synthesize information on stormwater inputs; assess and develop conclusions about management program effectiveness.*
- *Estimate loads from atmospheric deposition, identify sources of these loads, and develop conclusions about need for and approaches to local, regional, and even international controls.*
- *Require dischargers to monitor more effectively, completely.*
- *Add data collection on contaminants in plankton and trend record through sediment cores.*
- *Bay-scale coordination of characterization and/or monitoring (coordinate across various scales and to various endpoints), especially to answer questions about effects of (local) sources, actions, changes, etc.*

Question 3. With regard to toxics, how well does PSAMP fill science gaps to help develop management actions?

Context

“A research program...to provide current research information to managers and scientists, and to establish priorities based on the needs of the Action Team.” (RCW 90.71.060)

“Apply information on the status and trends of forage fish, groundfish, marine birds, seagrasses, and other select species to help guide conservation and recovery activities.” (05-07 PSCR)

Identify threats to human and marine wildlife health from exposure to toxic contaminants in the marine food web. (05-07 PSCR)

Disseminate research and monitoring results to managers. (05-07 PSCR)

Provide data from the Puget Sound Ambient Monitoring Program (PSAMP) and other research efforts in easy-to-use formats to scientists, planners, educators and managers so that they may use and benefit from the findings. (05-07 PSCR)

Use scientific data to identify and set priorities for emerging issues (e.g., toxic contamination, water quality degradation, habitat changes) in order to:

- a. Focus development of new research partnerships to address important and/or urgent questions.

- b. Refer issues to appropriate management authorities for rapid response to significant environmental changes. (05-07 PSCR)

Apply predictive models and assessment tools, including models that help predict the fate and transport of contaminants through the food web, to help guide restoration and protection actions for Puget Sound processes, habitats and species. (05-07 PSCR)

Provide technical assistance in sampling and analysis procedures, protocols and guidelines to governments, community groups and other scientists to help generate consistent, high quality and scientifically sound data about Puget Sound. (05-07 PSCR)

Implement the Intensively Monitored Watershed Program to investigate cause-and effect relationships in select watersheds and estuaries. (05-07 PSCR)

Overall Assessment

Fairly well.

Through intermittent and ongoing collaborations, PSAMP components involved in toxics have contributed to studies to fill gaps and communicate findings to relevant managers. (For example, PBDE studies in fish and sediments; endocrine disruption as evidenced by egg protein production in male fish; providing sample collection and/or sampling platform for others).

Observations/Findings:

- No ongoing institutional mechanism to define priorities (although NOAA Northwest Fisheries Science Center effort in 2005 may lead to this); no existing conduit for PSAMP and/or researchers to hear/receive information about the needs of the Puget Sound Action Team in support of focusing or assessing priorities.
- PSAMP has limited investments in research elements. Some of this work is done outside of PSAMP, sometimes in partnership with PSAMP or PSAMP scientists working through informal mechanisms.
- Limited integration across agencies and media-based programs;
- Limited assessment capacity for assessing sources and fates of contaminants entering Puget Sound, investigating pathways of exposure for elevated samples; or evaluating trophic dynamics and implications of exposures at different times and settings.
- Predictive models and assessment tools for evaluating toxics in the marine environments of Puget Sound are generally lacking.

Recommendations:

- *Increase funding for diagnostic/problem solving research studies and technical integration. Fund, design, implement, and use results of diagnostic studies to catalyze new, better management strategies and actions.*
- *Similarly establish mechanism to fund integrated studies and predictive models for use by managers to apply to pressing ecosystem-scale issues.*

- *Evaluate emerging chemicals of concern and endpoints (e.g., endocrine disruption) for Puget Sound;*
- *Investigate potential human health exposure/threat via consumption – of shellfish both bivalves and crustaceans), fish, birds, subsistence/cultural mammals - to contemporary toxic pollutants. Consider biomagnification pathways.*
- *Review sediment management standards & stormwater programs (permits) as potentially significant sources of toxics loadings.*
- *Interpret threats from various source loadings by integrated modeling of transfer & assessment of hazards and risks*
- *Pursue bay-scale coordination of characterization and/or monitoring (coordinate across various scales and to various endpoints), especially to answer questions about effects of (local) actions, environmental responses, changes, etc.*

Question 4. With regard to toxics, how well does the governance structure of PSAMP function?

Poorly.

Observations/Findings:

- Sampling and analysis protocols vary among programs. While many core protocols were established early within PSAMP, some protocols vary by particular use; some protocols may need to be established as analytical metrics and indicators are broadened.
- Biennial Puget Sound Georgia Basin Research conference accomplishes significant dissemination to managers and scientists but other aspects of a research program (identifying priorities; funding) are lacking.
- PSAMP publications (Puget Sound Update and component reports and publications) and data are (increasingly) available (e.g., via web);
- Important to ensure central PSAMP voice for communicating initial PSAMP findings, issues, news.
- Need to improve direct coordination and communication of PSAMP science with agency programs and managers representing Puget Sound Action Team.
- PSAMP technical investigators and steering committee lack trigger mechanism for enhancing intensity or focus or integration of diagnostic studies to identify corrective strategies and actions once ambient monitoring warning flags are acknowledged.
- No ongoing effort to define priorities although NOAA Northwest Fisheries Science Center effort in 2005 may lead to this; no existing conduit for PSAMP and/or researchers to hear/receive information about the needs of the Action Team.

Recommendations:

- *Rotate co-chairs of PSAMP committees identifying both a state and federal co-chair.*
- *Enhance coordination and governance of monitoring activities, e.g., through topic groups, Southern California Coastal Water Research Project or San Francisco's Regional Monitoring Program-like structure.*
- *Develop institutional mechanisms to prioritize and fund this gap in responding to applied, problem solving research.*
- *Enhance governance mechanisms to address this gap through topic groups with the ability to request a Management Committee written response.*
- *Develop stable funding for monitoring: (1) centralize funding; (2) investigate models that integrate regulatory & ambient monitoring.*
- *Expand representation on PSAMP (e.g., USGS, tribes).*
- *Ensure non-Puget Sound Action Team PSAMP presence (or independent Puget Sound science representative) at every meeting of Puget Sound Action Team Partnership and Council.*
- *Improve communications to ensure it is useful for social marketing, hazard/risk advisories, education, and reaches managers, public, media, etc.*
- *Enhance current use and linkage of web sites to convey new information about what's happening currently and what to expect in the coming months.*

Question 5. What priority improvements should be made in PSAMP to improve results regarding toxics?

- a) With regard to toxics, what more needs to be done to meet PSAMP's legislative mandate?
 - Synthesis of data from various sources to help focus, prioritize and evaluate.
 - Database coordination (e.g., via node design per Pacific Northwest Water Quality Data Exchange).
 - Better communication to PSAMP about (potential) changes in inputs (e.g., cleanup, discharge changes).
 - Compatibility among environmental program data sets and assessment of toxics across various media.
- b) With regard to toxics, **what more needs to be done** to fulfill the role of science as described in the 2005-2007 Puget Sound Conservation and Recovery Plan?
 - Integrated food web models (at various scales, especially bays & basin-wide) of sources, pathways, accumulation, and effects.
 - Institutional mechanisms to:
 - elevate issues identified through science to managers
 - deliver PSAMP's and other scientists' input/feedback on Action Team priorities

- invite advice from managers on directions for science efforts via:
 - Focus sheet approach
 - Southern California Coastal Water Research Project integrated source-ambient work (also San Francisco Regional Monitoring Program)
- Ensure compatibility of parameters (analyte lists), sampling approaches/protocols from PSAMP and others.
- Require use and updating of protocols.
- Seek opportunities to conduct cross program methods comparison.
- Review cleanup site monitoring to check that it is providing information on trends in urban areas and the environmental response to local efforts.
- Systematic approach, in PSAMP, to search for evidence of other contaminants or potential effects in different parts of Puget Sound.
- Prioritized and sequenced clean-up strategy for reducing toxics in the marine environments of Puget Sound.

4 PSAMP Hypoxia Review

Convened by Ken Dzinbal.

Meeting Venue: WA Dept of Ecology, Olympia, Monday 7/18/05, 10am – 2pm

Attendees (16):

Bill Backous, WDOE	Jan Newton, UW
Al Devol, UW	Sandie O'Neill, WDFW
Maggie Dutch, WDOE	Wayne Palsson, WDFW
Ken Dzinbal, WDOE	Scott Redman, PSAT
Karol Erickson, WDOE	Michael Rylko, EPA
Duane Fagergren, PSAT	Kim Stark, King Co.
Brian Grantham, WDOE	Ron Thom, Battelle
Tom Mumford, WDNR	Mark Warner, UW

The following report summarizes the findings and recommendations of the PSAMP hypoxia review workshop held in Olympia on July 18, 2005. The report begins with a short overview of how hypoxia is currently monitored by PSAMP, followed by responses to five basic questions.

The first three questions examine how well PSAMP's current hypoxia assessment activities meet PSAMP's statutory mandate (i.e. Puget Sound Water Quality Protection Act (RCW 90.71.060, 1996)) and the intent of the "2005-2007 Puget Sound Conservation and Recovery Plan." Relevant excerpts from those two guiding documents are provided below.

The last two questions address PSAMP governance issues and the need for any technological improvements.

This report includes the findings and recommendations of the workshop participants. All recommendations offered by the participants are (hopefully) included, but recommendations are not prioritized, and do not necessarily reflect consensus.

Overview: How does PSAMP currently monitor hypoxia?

PSAMP monitoring has included dissolved oxygen as a standard measurement since the inception of the Program in ~ 1989. The current program consists of monitoring for dissolved oxygen and associated variables conducted by Ecology, King County Department of Natural Resources and Parks (King County DNRP), and the University of Washington (PRISM Program and the Hood Canal Dissolved Oxygen Program). Ecology maintains a long-term network of fixed (and some flexible) stations sampled monthly by seaplane. King

County DNRP has a long-term monitoring program clustered around their treatment plant outfalls, and has collected extensive data through studies related to the proposed Brightwater treatment plant. The University of Washington currently leads the Hood Canal Dissolved Oxygen Program (HCDOP), supports the annual PRISM cruises in Puget Sound and hosts the Puget Sound Marine Environmental Modeling (PSMEM) partnership of which Ecology and King County are partners. These monitoring programs are typically well-coordinated and PSAMP scientists often have cross-involvements in related programs (e.g. Ecology assists on PRISM cruises, etc.).

Most dissolved oxygen data is currently generated from CTD casts with discrete bottle samples collected for quality assurance. Moorings (both profiling and static) are increasingly being used to improve temporal resolution of data. Over the years, PSAMP agencies have successfully worked together and with other partners to maximize mutual benefits. Data availability and data sharing were not identified as issues or concerns related to assessing dissolved oxygen.

Coordination among scientists and the technical arms of agencies involved in dissolved oxygen measurement appears to occur as needed and was not identified as an issue or concern.

Question 1. How well does PSAMP assess the health of Puget Sound with respect to hypoxia?

Context

“The Puget Sound Ambient Monitoring Program... shall include... (2) A monitoring program...[that provides]...key indicators of Puget Sound health.” (RCW 90.71.060)

Findings

Fairly well.

The current program can describe ambient conditions and identify waters susceptible to hypoxia at a coarse scale (approx 35 stations across all of Puget Sound). However, the program does not have enough funding to relate changes in hypoxia to specific management actions or programs. Nor can the current program afford the research needed to describe and understand important underlying processes and dynamics of hypoxia in Puget Sound.

Indicators of hypoxia and susceptibility to hypoxia developed by Ecology for PSAMP have been regularly published in the Puget Sound Update, Puget Sound Health Report, the State of the Sound Report, at several Puget Sound Research Conferences, and on Ecology’s web site.

The major limitations to assessing the health of Puget Sound are:

- i. While PSAMP is able to assess the overall status and trends of hypoxia in Puget Sound (at a coarse scale), we are unable to investigate the underlying causes for the patterns we detect.

- ii. Monitoring of boundary conditions that can affect hypoxia (e.g., ocean conditions, nearshore fluxes, climate impacts) are not actively integrated into PSAMP.

Several comments and recommendations made by the 2005 workshop participants were similar to Key Findings from the 1995 PSAMP Review (noted below where applicable; see Shen 1995).

Recommendations:

- *Do not reduce monitoring efforts or break on-going time-series (Importance of maintaining time-series uninterrupted was a Key Finding of 1995 PSAMP Review).*
- *Fund measurement of boundary conditions (see also Question 2). (Importance of acquiring ocean boundary data from the Strait of Juan de Fuca was a Key Finding of 1995 PSAMP Review).*
- *Secure funding to support the Integrated Assessment and Modeling (IAM) of susceptible marine basins or similar geographic regions. (This is the approach currently being used by the Hood Canal Dissolved Oxygen Program – HCDOP – to assess hypoxia in the canal). Utilization of modeling was a Key Finding of 1995 PSAMP Review*
- *Incorporate TMDL modeling and TMDL effectiveness monitoring as components linked to PSAMP.*
- *Fund research studies focused on evaluating the effects of hypoxia on key species (people care about the effects of dissolved oxygen on fish, shellfish, and other marine life).*
- *Link environmental indicators to program and project performance measures. Resource agencies and management decisions should be informed by data that describes the effectiveness of projects and programs implemented to improve conditions in Puget Sound. Linking environmental indicators to project and program performance is also necessary to describe “so that” linkages (e.g. we want to reduce stormwater nutrient loading by 20% so that nutrients are reduced in Puget Sound so that phytoplankton concentrations are reduced so that dissolved oxygen conditions improve)..*
- *Create a funding and management structure to identify, prioritize, and conduct process-related studies and research that will evaluate health.*

Question 2. How well does PSAMP assess the success of management strategies?

Context

“The Puget Sound Ambient Monitoring Program... shall include... (2) A monitoring program...[that provides]...performance measures that can be used by the governor and legislature to measure the effectiveness over time of programs and actions initiated under the plan to improve and protect Puget Sound water quality and biological resources.” (RCW 90.71.060)

The “2005-2007 Puget Sound Conservation and Recovery Plan” addresses hypoxia as a specific issue under Priority 4:

Priority 4: “Prevent nutrient and pathogen pollution caused by human and animal wastes.” Hood Canal is identified as a special Geographic Priority for 2005-2007 because its “health is at serious risk from hypoxia... caused in part by excessive nutrients in the water that lead to algae blooms.”

Note - The statutory mandate specifies that PSAMP should “provide performance measures that can be used to by the governor and legislature to measure the effective of programs and actions initiated under the [Puget Sound] Plan.” Generally, PSAMP does not directly monitor the effectiveness of management strategies. Instead, it monitors ultimate outcomes in the health of the system, such as water quality and the health of biological resources.

Findings

With respect to short-term outputs: poorly.

With respect to ultimate outcomes: well.

Current performance measures for hypoxia have been effective at identifying waters susceptible to hypoxia at a coarse scale. We do not have enough funding to go further than that to identify specific sources, dynamics, and processes that would allow us to make reliable recommendations for management actions. Nor can we adequately evaluate the effectiveness of projects or programs intended to mitigate conditions or reduce inputs possibly contributing to hypoxia.

Recommendations

Fund a complete monitoring program to assess the short and long-term effectiveness of management actions and to provide accountability for agency decisions around resource management in Puget Sound. This monitoring program should include:

- *A long-term core monitoring program to determine improving or declining trends over time at management-appropriate scales.*
- *Funding to support modeling and predictive forecasting.*
- *Funding to monitor and investigate the dynamics of major boundary conditions (this is essential for understanding natural conditions vs human impacts, and to develop reliable water quality models). The boundary conditions we need to measure and understand are:*
 - *nearshore processes and dynamics*
 - *ocean boundary conditions*
 - *watershed inputs*
 - *climate change*

Question 3. How well does PSAMP fill science gaps?

Context

“The Puget Sound Ambient Monitoring Program... shall include... (1) A research program...to provide current research information to managers and scientists, and to establish priorities based on the needs of the Action Team.” (RCW 90.71.060)

The “2005-2007 Puget Sound Conservation and Recovery Plan” proposes a strategy and specific “Desired Results” for science activities in 2005-2007. The proposed strategy includes:

- Conduct... research and monitoring activities to improve the scientific understanding... and evaluate the effectiveness of... management programs.
- ... Collaborate and coordinate interdisciplinary efforts to expand Puget Sound science...
- Provide information to citizens, government leaders, and resource managers...

Findings

Fairly poorly.

Note - The PSAMP research program that is mandated by statute was never implemented, with the exception of the Puget Sound / Georgia Basin Research Conference. The 2000 Puget Sound Management Plan calls for support of research activities by making scientifically valid data available, and the 2005-2007 Puget Sound Conservation and Recovery Plan proposes a strategy including “conduct Puget Sound research and monitoring activities; [and] “expand the knowledge base of Puget Sound science through collaborations of partner agencies with academic and scientific institutions...”.

PSAMP does not have an identified research program, e.g. with coordinated goals and dedicated funding. However, PSAMP scientists have focused on areas of concern that have spawned separate initiatives and collaborative efforts (e.g. HCDOP, PSNERP¹) funded (primarily) by outside sources.

The current PSAMP program does not have enough funding to relate changes in hypoxia to specific management actions or programs. Nor can the current program afford the research needed to describe and understand important underlying processes and dynamics of hypoxia in Puget Sound.

While the research program portion of PSAMP has never been funded, PSAMP has been successful at addressing important gaps in monitoring and there is little-to-no duplication of monitoring activities among partner agencies or other collaborators.

¹ Puget Sound Nearshore Project, formerly the Puget Sound Nearshore Ecosystem Restoration Project.
<http://pugetsoundnearshore.org>

Recommendations

- *The legislative mandate for a research program within PSAMP needs to be addressed.*
- *A funding base (perhaps competitive funding) needs to be established to support the mandated research program and to implement the proposed strategy in the 2005-2007 Puget Sound Conservation and Recovery Plan.*

Question 4. How well does the current governance structure of PSAMP function?

Poorly.

The July 18th workshop did not dwell on governance issues, though this subject did receive some pointed comment. Most concerns expressed at the workshop were reminiscent of ones also expressed during the 1995 Review, namely a sense among PSAMP scientists that their work was not well understood, its usefulness was not sufficiently appreciated at higher management levels, and many mandates were never adequately funded. Because similar concerns expressed in the 1995 Review resulted in the current PSAMP governance structure (in particular the formation of the Management Committee), the success of those changes in addressing these long-standing concerns was questioned (i.e. have the governance changes implemented in response to the 1995 review really worked?).

One significant change since 1995 noted by workshop participants has been the creation of several new bodies charged with coordinating statewide or regional monitoring activities. While (again) not a subject of focus during the July 18 workshop, comments were offered to the effect that coordination among the coordinating bodies was itself becoming complicated and potentially confusing (e.g. the Governor's Monitoring Forum, the Pacific Northwest Aquatic Monitoring Partnership, PSNERP, the Shared Strategy for Salmon Recovery).

Recommendations (*because the workshop did not focus on this aspect, few specific recommendations were offered with regard to governance. - but pointed concerns were expressed as noted in the commentary above*):

- *Improve governance of PSAMP research and monitoring to better support existing mandates and strategies.*
- *Create a funding and management structure to identify, prioritize, and conduct process-related studies and research.*
- *Evaluate and elevate links between PSAMP scientists and agency managers.*

Question 5. What technical improvements could be made in the PSAMP hypoxia monitoring?

The July 18th review meeting did not focus on a technical review of hypoxia monitoring parameters and methods. However, this was a focus of the 1995 PSAMP review, and several recommendations from that review remain relevant today. With particular regard to monitoring hypoxia, the 1995 Review recommended monitoring ocean inputs via the Strait

of Juan de Fuca and, when possible, to incorporate modeling approaches to better understand Puget Sound dynamics.

The July 18 workshop did find that current hypoxia monitoring is not complete, as indicated in the recommendation below (this is the same recommendation as included under question 2, but it fits here as well).

Recommendations

Fund a complete monitoring program to assess the short and long-term effectiveness of management actions and to provide accountability for agency decisions around resource management in Puget Sound. This monitoring program should include:

- *A long-term core monitoring program to determine improving or declining trends over time at management-appropriate scales.*
- *Funding to support modeling and predictive forecasting.*
- *Funding to monitor and investigate the dynamics of major boundary conditions (this is essential for understanding natural conditions vs human impacts, and to develop reliable water quality models). The boundary conditions we need to measure and understand are:*
 - *nearshore processes and dynamics*
 - *ocean boundary conditions*
 - *watershed inputs*
 - *climate change*

5 PSAMP Nearshore Habitat Review

Convened by Loren Stern and Sarah Brace.

Meeting Venue: Natural Resources Building, Olympia, Thursday 7/28/05, 10am – 3pm

Attendees (15):

Helen Berry, WDNr	Tom Mumford, WDNr
Sarah Brace, PSAT	Dave Nysewander, WDFW
Tim Determan, WDOH	Sandie O'Neill, WDFW
Pete Dowty, WDNr	Scott Redman, PSAT
Duane Fagergren, PSAT	Loren Stern, WDNr
Kurt Fresh, NOAA Fisheries/NWFSC	Curtis Tanner, WDFW / USFWS
Guy Gelfenbaum, USGS Menlo Park	Heather Trim, People for Puget Sound
Brian Grantham, WDOE	

This summary contains an assessment of PSAMP nearshore activities. The summary is divided into the five parts listed below. The first three questions review activities in terms of PSAMP's statutory mandate (Puget Sound Water Quality Protection Act (RCW 90.71.060, 1996)) and associated management strategies, which are provided below with associated excerpts. The last two questions review PSAMP's implementation through examining governance and technical issues.

The findings and recommendations for each review question are summarized on the following pages. All recommendations by workshop participants are included. Recommendations are not prioritized, and do not reflect consensus.

Question 1. How well does PSAMP assess the health of Puget Sound?

Context

"A monitoring program...[that provides]...key indicators of Puget Sound health." (RCW 90.71.060)

Findings

Fairly well.

PSAMP produces status and trends indicators of Puget Sound health useful for general assessment and for "early warning" through agency reports, the Puget Sound Update, Puget Sound Health and the State of the Sound indicator reports.

Two important limitations to assessing the health of Puget Sound are:

- i. The program lacks a strong unifying strategy and reflects a shotgun approach to selecting indicators and performance measures.
- ii. While the program addresses the need to assess patterns in the Puget Sound system, it does not address the need to understand causes for these patterns upon which corrective actions can be based.

The origin of the shotgun approach is largely attributable to the initial purpose of PSAMP, which was established to fill existing monitoring gaps. Non-PSAMP monitoring is relevant to assessing Puget Sound health (e.g. salmon, rockfish and herring stock assessments, urchin populations) but the primary purpose of these efforts is related to respective agency missions. PSAMP is unique in that the primary purpose of the monitoring is to assess Puget Sound health. But the lack of a strong overarching strategy complicates effective outreach and charting of a clear course for the program.

Many of the comments and recommendations made by workshop members were similar to Key Findings of the 1995 PSAMP Review (Shen 1995).

Recommendations:

- *Do not reduce current status and trends monitoring.*
- *PSAMP should develop and apply ecosystem and conceptual models. (Key Findings of 1995 PSAMP Review).*
- *Strategically select a suite of indicators to demonstrate trends in health of PS through the use of a conceptual model. Link elements of health to effectiveness of management strategies and support of socially important biological resources.*
- *Add monitoring of physical variables in the nearshore, e.g. sediment sources and transport and integrity of drift cell processes.*
- *Make full commitment to funding marine birds and mammals component of PSAMP.*
- *PSAMP should strengthen interdisciplinary linkages rather than function as individual tasks. (Key Findings of 1995 PSAMP Review).*
- *Ensure that capabilities of each component are consistent with needs of the conceptual model and weigh existing components against other needs.*
- *Convene scientists around Topic Groups as method to integrate monitoring questions.*
- *Funds must be dedicated specifically to synthesis of results – i.e. data interpretation and data management. (Key Findings of 1995 PSAMP Review).*
- *PSAMP should establish periodic comprehensive surveys of PS monitoring efforts. (Key Findings of 1995 PSAMP Review).*
- *Establish an effective process to link findings to subsequent management actions.*
- *Take steps to increase visibility and level of understanding of PSAMP within the general science community and the Action Team.*

Question 2. How well does PSAMP assess the success of management strategies?

Context

“A monitoring program...[that provides].... performance measures that can be used by the governor and legislature to measure the effectiveness over time of programs and actions initiated under the plan to improve and protect Puget Sound water quality and biological resources.” (RCW 90.71.060)

The Puget Sound 2005-2007 Conservation and Recovery Plan identifies two priorities that are closely related to nearshore habitat, with associated strategies for the Action Team partnership:

- Priority 5: Protect shorelines and other critical areas that provide important ecological functions.
- Priority 6: Restore degraded nearshore and freshwater habitats.

Findings

With respect to short-term outputs: poorly.

With respect to ultimate outcomes: fairly well.

The statutory mandate specifies that PSAMP should “provide performance measures that can be used to by the governor and legislature to measure the effective of programs and actions initiated under the [Puget Sound] Plan.” Generally, PSAMP does not directly monitor the implementation of management strategies but the ultimate effectiveness. The PSAMP program was designed to provide large-scale (Puget Sound-wide) monitoring of ultimate outcomes in the health of the system, such as water quality and biological resources. Most PSAMP monitoring does not occur at appropriate spatial scales (basin or embayment, for example) to adequately address localized management questions.

PSAMP monitoring is not directly tied to priorities and strategies articulated in the 2005-2007 Puget Sound Conservation and Recovery Plan. For Priority 5 for example, PSAMP does not systematically or strategically provide information to assess the success of efforts to produce updates to Critical Area Ordinances (CAOs), Shoreline Master Programs (SMPs) or NPDES general stormwater permits. Similarly, PSAMP does not provide information to assess efforts to implement specific conservation tools or to integrate regulatory and conservation approaches in implementing watershed and salmon recovery plans. Some PSAMP data are used extensively in local government planning efforts, such as the ShoreZone Inventory and bird distribution information. In this way, PSAMP meets the technical assistance strategy that is part of Priority 5.

Other management needs that have not been met by PSAMP include:

- a) Research that assesses the effectiveness of existing Best Management Plans (BMPs) or suggests alternate BMPs,
- b) Technical assistance to deliver research findings to state regulatory agencies and local jurisdictions,
- c) Data to assess the effectiveness of local planning efforts, such as CAOs and SMPs.

The DOH shellfish component of PSAMP is unique in its tight linkage with regulatory activities and consequent management relevance. The actual monitoring (field data collection) is part of a regulatory framework. PSAMP analyzes these data to focus on status and trends, rather than to meet regulatory requirements. However the PSAMP findings are directly relevant to the assessment of pollution sources and the management of shellfish growing areas.

The newly established GMAP logic model links short-term outputs of management strategies to ultimate outcomes. In the case of Priority 5, the ultimate outcomes are represented by the long-term goal that includes the preservation of ecological processes and the minimal loss of habitat. PSAMP provides excellent data for assessing the ultimate outcome associated with Priority 5 in the nearshore through monitoring parameters such as eelgrass area and marine bird populations.

PSAMP doesn't address salmonids directly, nor is it well coordinated with salmon recovery monitoring.

Recommendations

- *Develop research to begin to answer “why” question-, why are we seeing changes, i.e. linking changes in status/trends to stressors.*
- *Develop logic models (after GMAP) that explicitly link priorities and strategies with PSAMP environmental monitoring as well as short-term outcome measures.*
- *Assess science needs for efforts to update Critical Area Ordinances, Shoreline Master Programs and stormwater permits. Assess usefulness of PSAMP data in these efforts.*
- *PSAMP committees should reassess the dichotomous goals of monitoring both system health and management effectiveness. Is it appropriate for PSAMP to monitor both?*
- *Create a more effective way to disseminate PSAMP findings through press releases, etc.*

Question 3. How well does PSAMP fill science gaps?

Context

“A research program...to provide current research information to managers and scientists, and to establish priorities based on the needs of the Action Team.” (RCW 90.71.060)

Findings

Fairly poorly.

The PSAMP research program that is mandated by statute was never implemented, with the exception of the Puget Sound / Georgia Basin Research Conference. The 2000 Puget Sound Management plan calls to support research activities by making scientifically valid data available.

PSAMP does not have a viable research program, e.g. with coordinated goals and funding. Some research occurs within PSAMP but it is piecemeal, uncoordinated, and opportunistic, not strategic. It is interesting to note that PSAMP data and staff focus on areas of concern that spawn separate initiatives and collaborations (e.g. Hood Canal Dissolved Oxygen Program, Puget Sound Nearshore Restoration Program). It is also interesting to note that most research occurs through external collaborations rather than among PSAMP components.

PSAMP currently does not serve to prioritize research needs for Puget Sound. A new independent body not closely aligned with a particular agency would need to be formed to serve this function. Such a body would need to have a funding mechanism. CALFED could serve as a model for this function. This body could contain some PSAMP Management Committee members.

While the research program portion of PSAMP is largely unimplemented, PSAMP has been successful at addressing gaps in other monitoring and there is little-to-no duplication with other efforts.

Recommendations

- *Define the roles and relationships of PSAMP, particularly in relationship to other research and science planning efforts such as those being conducted by USGS.*
- *The PSAMP investigators and staff have research expertise and should be included as part of a research plan.*
- *Convene science advisory group to decide how the Puget Sound science community should answer integrated questions in the nearshore.*
- *Develop comprehensive research plan for the Puget Sound nearshore.*
- *Form a separate program management/science advisory body not closely aligned with any particular agency to run a research program with separate funding. Some PSAMP Management Committee members should be considered for this body and the Management Committee could be dissolved.*
- *Secure funding to support a dedicated synthesis effort.*
- *Re-scope PSAMP so as not to include the research component.*
- *Focus semi-annual Puget Sound/Georgia Basin Research Conference on assessing breadth and completeness of regional research effort, including work in the nearshore.*

Question 4. How well does the current governance structure of PSAMP function?

Poorly.

Currently, governance of PSAMP is not effective because the governing bodies are not actively involved in PSAMP's activities. Familiarity with PSAMP is low within the Management Committee, the Council, the Puget Sound Action Team staff and the executive

body (Action Team). There is little interaction between these oversight groups and the Steering Committee, which leads PSAMP activities.

More active governance of PSAMP activities could greatly strengthen PSAMP's management relevance, through both identifying monitoring priorities and following up on PSAMP findings. For example, governance should include a feedback loop that considers future funding requests based on PSAMP findings as part of the biennial budget cycle.

More focused guidance of PSAMP's priorities is needed. Currently, PSAMP's mandate includes diverse goals, such as monitoring status/trends, assessing effectiveness of management actions, and identifying causes of observed changes. Current funding does not allow PSAMP to meet all of these goals. In order for PSAMP to meet its goals, goals could be more narrowly defined or PSAMP activities and funding could be expanded.

Coordination of PSAMP's activities with external efforts could be improved. Other organizations with similar mandates that are high priorities for greater coordination include the Comprehensive Monitoring Strategy, the Governor's Monitoring Forum, the Shared Strategy's Nearshore Salmon Recovery Plan, and the Puget Sound Nearshore Ecosystem Restoration Project.

While all workshop members agreed that greater oversight is needed, opinions differed as to whether PSAMP should be expanded to encompass new efforts (e.g. form a Science Review Board) or contracted to facilitate greater focus on core activities (e.g. exclude effectiveness monitoring of management actions).

Currently, PSAMP is not an integral part of an adaptive management strategy.

Recommendations

- *Strengthen linkage of PSAMP monitoring to management needs.*
- *Better define unifying theme of PSAMP components and rationalize the haphazard nature of PSAMP structure.*
- *Develop a coherent outreach plan for PSAMP that recognizes a diverse audience with different needs.*
- *Ensure that PSAMP environmental performance measures are included as GMAP measures.*
- *Increase emphasis on reviewing budget requests to ensure highest priority needs are met.*
- *Form a Science Review Board to review programs, identify research and monitoring priorities, fund research, and provide 'one-stop shopping' for science.*
- *Secure a portion of various permit fees for status and trends environmental monitoring.*
- *PSAT directors should identify science needs to support local governments.*
- *Establish a topic group to identify research and monitoring needs to support local government efforts.*

- *Get regular non-PSAT representative from PSAMP at PSAT/Council meetings.*
- *Linkages between PSAMP components should be formalized and expanded.*

Question 5. What technical improvements could be made in the PSAMP nearshore monitoring?

The current review structure did not provide sufficient time for a thorough technical review of nearshore monitoring parameters and methods. Technical reviews are important tools for identifying key monitoring parameters and methodological improvements to existing programs. Some components have conducted technical review of individual projects.

A technical review of all PSAMP nearshore monitoring parameters and the underlying conceptual model that justifies their selection would provide insight into strengths and gaps in the current program, and help to identify priorities for future work.

Recommendations

- *Complete technical reviews of the individual PSAMP projects.*
- *Develop and use an ecosystem conceptual model to provide testable hypotheses about linkages between indicators, performance measures, management actions, and policy outcomes.*
- *Develop comprehensive data clearinghouse with web distribution of data.*
- *Update PSAMP metadata product.*
- *Assess PSAMP peer review processes and recommend improvements.*
- *Add monitoring of physical variables in the nearshore, e.g. sediment sources and transport and integrity of drift cell processes.*
- *Develop and maintain comprehensive PSAMP web site.*

6 References

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